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THE

NEW ZEALAND ENTOMOLOGIST

Vol. 2 No. 6. December, 1961.

Notes on New Zealand Ephemeroptera. I. The affinities with Chile and Australia, and remarks on *Atalophlebia* Eaton (Leptophlebiidae)

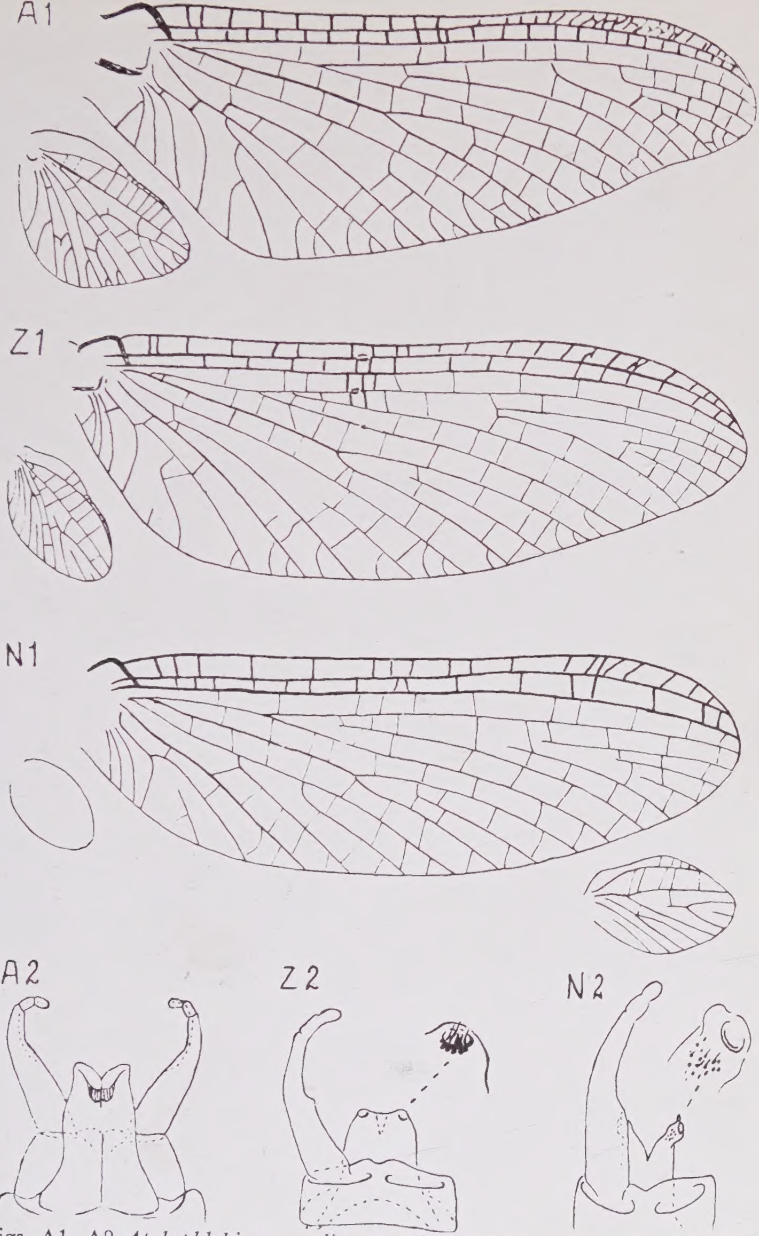
By J. G. PENNIKET,
C/o Canterbury Museum, Christchurch.

SUMMARY

Attention is drawn to the Paleantarctic endemism of several subfamilies or tribe-equivalents, and to the sub-regional endemism of genera in these cases. All New Zealand species previously in *Atalophlebia* Eaton (Leptophlebiidae) are transferred to a new genus *Zephlebia* having two subgenera the genotypes of which are *Zephlebia* (*Zephlebia*) *versicolor* (Eaton) and *Zephlebia* (*Neozephlebia*) *scita* (Walker).

Apart from the section dealing with *Atalophlebia*, little originality is claimed for anything in this paper. The references are scattered throughout the works of Eaton, Ulmer, Tillyard, Lestage, Barnard, Traver, Needham and Murphy, Harker, Riek and Demoulin; the latter (1955) added a very great deal to what was known of the Chilean fauna, and Edmunds (1957: 245-6) first correctly analysed the relationships of the Paleantarctic Siphlonuridae. Since many of the relevant papers are not readily available (indeed, in one or two cases there is no copy here at all) it is thought worth while briefly to summarise what is known in a New Zealand journal, partly as a service to local zoogeographers, and partly in the hope of stimulating others to prepare up-to-date summaries for other orders in Insecta.

Several supra-generic classifications of the order are current, usually recognising about eighteen families, only four of which are known to have representatives in New Zealand. All local genera are rather primitive, some extremely so. Considerable individual variation exists, there are known to be numerous poorly differentiated species in some of the genera, several Ephemeropteran niches appear to be more or less vacant (for example lakes and ponds), but some adaptive radiation has taken and probably still is taking place (for example *Deleatidium* has, for a Leptophlebiid,



Figs. A1, A2 *Atalophlebia australis*: venation and genitalia (after Tillyard 1936: Pl. I 4; 1934: Pl. II 2 and 7.) Z1, Z2 *Zephlebia* (*Zephlebia*) *versicolor*: venation and detail of penes from Westland specimen, genitalia of type (after Kimmins 1960.) N1, N2 *Zephlebia* (*Neozephlebia*) *scita*: venation of lectotype (after Kimmins), genitalia of type (after Kimmins 1960) and detail from Westland specimen.

TARLE I.

Distribution of Paleantarctic and related genera.

(Heavy type denotes endemism.)

Group	N.Z.	Chile	Australia	Elsewhere	Remarks
Siphlonuridae					
Siphlonurinae A	—	—	—	8 genera	Holarctic
Siphlonurinae B	**Nesameletus**	**Metamonius**	**Ameletoides**	—	
Oniscigastrinae	**Oniscigaster**	**Siphlonella**	**Tasmanophlebia**	—	
Ameletopsinae	**Ameletopsis**	**Chiloporter and Chaquihua**	**Mirawara**	—	
Isonychiidae					
Group A	**Coloburiscus**	**Murphyella**	**Coloburiscoides**	—	
Group B	—	—	—	Isonychia	Hol. and Oriental
Ichthybotidae	**Ichthybotus**	—	—	—	
Caenidae	—	(present)	**Tasmanocoenis**	4 other	Cosmop. excl. N.Z.
Baetidae	—	3 genera	4 genera (1 endemic)	15 all told	Cosmop. excl. N.Z.
Leptophlebiidae	(See Table II.)				
(Other families)	—	—	—	12 families	Various

an atypical microhabitat (more appropriate to certain absent families such as the Heptageniidae) and some very efficient morphological adaptations to it).

Figs. Z3, Z4 Z. (*Zephlebia*) undescribed species X: genitalia and hindwing. Z5 Z. (*Zephlebia*) undescribed species Y: genitalia.

Table I summarises the Paleantarctic distribution, and should be read in conjunction with the following notes. (a) Group A of the Isonychiidae is distinguishable from Group B at about the tribal level, but this has not been fully investigated, nor have the groups received formal nomenclatural recognition. The same is true of Groups A and B of the Siphlonurinae. The Isonychiidae are sometimes reduced to a subfamily of the Siphlonuridae which are usually considered to be the most archaic living family in the order. (b) *Ichthybotus* is sometimes regarded as a genus of the almost cosmopolitan Ephemeridae: its eventual rank may well be that of subfamily of the latter. (c) Except possibly in the Leptophlebiidae (where the situation is somewhat obscure) and in the highly evolved and almost ubiquitous Baetidae and Caenidae, no close relationships appear to exist between the Ephemeropteran fauna of South Africa and that of any Paleantarctic area, nor between those of Chile and the Brazilian region, nor between those of Australia and the Sunda region. (d) Inevitably, a few genera of very doubtful occurrence or validity have had to be ignored.

It will be seen that in each of four very striking cases, a primitive tribe or subfamily, one or two genera of which occurs in each subregion, is confined to Chile, Australia and New Zealand, but no genus is common to any two of these subregions. The correspondence is so very orderly that one is almost forced to invoke either landbridges, continental subsidence, or the Wegener theory to account for it. Tillyard (1926: 64, 477-8) believed that New Zealand and Australia received all their mayflies (except the Australian Baetidae which he says are "of tropical origin") via Paleantarctic landbridges in Upper Jurassic or Lower Cretaceous times. The presence of Caenidae in Australia was unknown to him at that time. He did not mention the Chilean affinities.

The Chilean Baetidae and Caenidae are almost certainly later migrants from the north. Zoogeographically speaking, these are the "rats and mice" among Ephemeroptera: their mode of dispersal, the nature of which remains a mystery, must be very efficient. several Baetid genera having a very nearly world-wide distribution. In contrast to the very short adult life of most mayflies (a few days or even hours) certain Baetid females are known to have lived for several weeks; there are reports of ovoviviparity in some genera, which also suggests a longer than normal adulthood. Possibly these females conserve moisture more efficiently than do those in other families—in Ephemeroptera generally, rapid and severe desiccation is probably a major obstacle to dispersal over long distances by air.

TABLE II.

Distribution of Paleantarctic Leptophlebiidae.

Genus	N.Z.	Chile	Austr.	Elsewhere
Group A				
Zephlebia n. g.	x	–	–	–
Deleatidium	x	x?	x?	–
Atalophlebioides	x	x?[1]	x?	Madagascar?[1]
Atalophlebia	–	x?	x	Ceylon? Japan?
Atalonella	–	x	x	–
Massartellopsis	–	x	–	–
Atalomicria	–	–	x	–
Jappa	–	–	x	–
Kirrara	–	–	x	–
Ulmerophlebia	–	–	x	–
(Several other)	–	–	–	Widespread
Group B				
Thraulodes	–	x	–	New World
Thraulophlebia	–	–	x[2]	–
(Many other)	–	–	–	Widespread

[1] Known from nymph only.
[2] Queensland.

Note: (a) The queries in the table reflect the writer's personal misgivings.

(b) No species is common to any two of the three regions.

(c) The division of the family into two groups is along the lines indicated by Traver (1946: 419); genera in Group B are probably late migrants from the north.

Examination of four pinned collections, as well as the writer's own researches, have so far failed to demonstrate the presence in New Zealand of Baetidae or Caenidae which, if they were here at all, would probably be numerous and widespread. However, a new endemic family (described in Part III of this series, but excluded from Table I) having a Baetid microhabitat, a baetoid (or siphlonuroid—there is very little difference) nymph, and adult characters intermediate between those of the Siphlonuridae and the Baetidae, may have descended from the former and been ancestral to the latter; in so long-isolated a region as this, such a form might well remain unchanged while its relatives elsewhere evolved into the Baetidae.

The case of the endemic Ichthybotidae is similar in some ways: this monogeneric family has some features of the Ephemeridae and some of the Polymitarcidae, both of which are almost cosmopolitan, and is slightly more generalised than either. It is interesting to note that so far nothing whatever in this philetic line has been reported from Australia or Chile.

Oniscigaster is possibly the most archaic genus in the Ephemeroptera, even in the Pterygota (this is further considered in Part II of this series). Here again is a group which in the Paleantarctic has had to meet little or no competition: the mouthparts of the only group having a similar microhabitat (*Nesameletus* complex) suggest a different feeding pattern.

The *Coloburiscus* complex of the Isonychiidae has a torrential microhabitat from which it may have been ousted elsewhere by the Heptageniidae; the latter are sometimes considered to have descended from the Isonychiidae. *Isonychia* (Holarctic), however, seems to have avoided competition by a return to or retention of a Siphlonurid microhabitat.

The situation in the Leptophlebiidae is far from clear, except that the affinities of the three faunas one with another are greater than they are with those of other regions.

Tentatively then, it seems likely that Paleantarctica evolved (or was invaded by) a characteristic archaic Ephemeropteran fauna, fortunately preserved to us almost unchanged, of which the Caenidae and the Baetidae (absent from New Zealand) were not a part, these latter having subsequently invaded Chile and Australia from the north along *two* routes.

Turning now to the Leptophlebiidae: Table II summarises the present position, with which, it is safe to say, nobody currently interested in the southern Leptophlebiidae is entirely satisfied. All the genera remain very imperfectly known, the nymphs of several are either unknown or have not been certainly associated with the adults, and species have been shuffled into and out of the second.

third and fourth listed to find a succession of uneasy resting-places; however, several overseas workers are investigating the problem, and some clarification should shortly be forthcoming. The writer is studying a large number of New Zealand species, most of them undescribed, and suspects that all New Zealand Leptophlebiidae may eventually prove to be distinct from those of Chile and Australia at subgeneric or generic levels.

As a concrete example of this the position of the New Zealand species currently in *Atalophlebia* Eaton is here briefly considered in advance of a more detailed treatment.

Atalophlebia Eaton

Eaton himself (1899: 286) has said of *Atalophlebia,* "The homogeneity of this genus, alluded to with implied suspicion as long ago as 1884 in *Trans. Linn. Soc. Lond.* (2) *Zool.,* vol iii, p. 84, remains uncertain." This is almost as true today, even though many new species have been described and several homogeneous groups recognised for some of which new genera have been erected, for example *Massartella* Lestage, *Aprionyx* Barnard and *Atalonella* Needham and Murphy. Originally a large number of species, none of the nymphs of which were known, were assembled in *Atalophlebia* largely because of similarities in the hindwings in spite of gross dissimilarities in the forewings and in the genitalia.

Therefore it would be unwise to compare the New Zealand species with more than just that small homogeneous group of Tasmanian species (hereinafter referred to as *Atalophlebia* (restr.)), which comprises *A. superba* Tillyard, *A. albiterminata* Tillyard, *A. hudsoni* Tillyard and the genotype *A. australis* (Walker). (This need not imply that some mainland species do not belong in the genus; that the validity of *Atalonella* took thirty years to establish was the direct consequence of unwillingness to restrict *Atalophlebia* even temporarily to the genotype and the best-described of its nearest allies.) The characters of the group were extracted from the works of Tillyard (1934 and 1936), the excellent photograpns of forewings in Plate I of the latter paper proving especially valuable. (Fig. A1 of the present paper is based on an enlargement of his photograph No. 4 of 1936, rather than on his Pl. II, Fig. 1 of 1934.)

The characters of the New Zealand groups were obtained from the study of (a) nine species, hereinafter referred to as the versicolor group, comprising *A. versicolor* Eaton (reared), *A. dentata* (Eaton), *A. cruentata* Hudson, and six undescribed species (two reared), and (b) the scita group comprising *A. scita* (Walker) (reared) and *A. nodularis* (Eaton) (no fresh material available, but the relationship of the two is certain—the venations, as well as the genitalia of the types (Kimmins 1960: Figs. 40, 41), are almost indistinguishable, and the nymph of the former proves to

agree very well with Phillips' (1930: 355 and Pl. 62 6) description of that of the latter.) All relevant literature was consulted, and attention should here be drawn to the useful photographs of forewings in Plate II of Mosely's little-known paper of 1932 (all the specific diagnoses in this plate appear to be correct except in Figs. 12 and 14 (*Nesameletus*) which will be dealt with elsewhere.)

The following key distinguishes between the groups, and erects *Zephlebia* gen. nov. with new subgenera (*Zephlebia* and *Neozephlebia*).

1. Forewing markedly triangular, broadest where posterior cubital intercalary attains margin, CuA and CuP markedly sigmoid and much closer together at two-fifths of length of CuP from origin than at one-fifth, MA fork proximally symmetrical about stem; hindwing sub-triangular, from one-quarter to one-third as long as forewing; "pockets" of penes (if present) ventral and unarmed, other accessory structures sometimes present; each gill-lamella multifid (Fig. A1, A2; Tillyard 1934: Pl. II; Tillyard 1936: Figs. 4-6, 11-13, 17-18, Pl. I, 3-9.) .... *Atalophlebia* (restr.)

   Forewing *not* markedly triangular (tornus ill-defined), broadest where CuA attains margin or distad thereof, CuA and CuP slightly sigmoid and subparallel for proximal two-fifths of CuP, MA fork proximally asymmetrical about stem (MA2 sags); hindwings oval, *less* than one-quarter as long as forewing; penes each with a conspicuous apical cup-shaped recess (gonopore) armed internally or adjacent to the rim with several small but very noticeable spines or tubercles, other accessory structures *never* present; each gill-lamella entire (References as in couplet 2) ..... *Zephlebia* gen. nov. 2

2. Proximally, MP2 in forewing much closer to CuA than to MP1; hindwing *not less* than one-fifth length of forewing. A1 present; penes conjoined almost if not quite to tips, spines within or on rim of "cup"; distal margin of subanal plate of ♀ very slightly if at all emarginate. In the nymph, head broad and rectangular, gills broadly ovate-acuminate with tracheation much ramified, gills almost continuously rapidly vibrated (in aquarium), nymph typically clings to stones and submerged timber, transforms from surface of water (Figs. Z 1-5; Mosely 1932: Pl. II 8-11; Phillips 1930: Fig. 10, Pl. 62 2 and 3.) ..... versicolor group=*Zephlebia* subgen. nov. (Genotype: *Z.* (*Z.*) *versicolor* (Eaton)).

   Proximally, MP2 in forewing much closer to MP1 than to CuA; hindwing *not more* than one-sixth length of forewing. A1 absent; penes markedly divergent in distal half, tubercles slightly basad of "cup"; distal margin of subanal plate of ♀

with deep narrow cleft. In the nymph, head rounded anteriorly, gills long-lanceolate each lamella with a thick unbranched central trachea, gills very seldom vibrated and then rather slowly, nymph typically clambers amongst weed, transforms while clinging to leaf or similar situation above the surface (Figs. N 1 and 2; Mosely 1932: Pl. I 4; Phillips 1930: Pl. 62 4-6, and text 355) ..... scita group=*Neozephlebia* subgen. nov. (Genotype: *Z.* (*N.*) *scita* (Walker)).

A number of lesser characters also separates these groups and these will be dealt with when the new species are described, but attention may here profitably be drawn to the very striking differences between *Zephlebia* and *Atalophlebia* (restr.) in the comportment of the admittedly somewhat variable cubital intercalaries and apical veins (especially IR2 and R3b), and to the marked difference in breadth of forewing between the new subgenera.

The following new combinations are here effected: *Zephlebia* (*Zephlebia*) *dentata* (Eaton), *Zephlebia* (*Zephlebia*) *cruentata* (Hudson), *Zephlebia* (*Zephlebia*) *borealis* (Phillips) and *Zephlebia* (*Neozephlebia*) *nodularis* (Eaton). The imago of *Z.* (*Z.*) *dentata* is almost indistinguishable from *Z.* (*Z.*) *versicolor* in colour and venation, and has the characteristic *Zephlebia* penes (Kimmins 1960: Fig. 38). A dried ♂ imago of *Z.* (*Z.*) *cruentata* with a Tillyard determination label "Atalophlebia cruentata Huds." in the Canterbury Museum collection agrees perfectly with Hudson's (1904) and Phillips' (1930) descriptions: the species is unique among New Zealand Leptophlebiidae in that the anterior cubital intercalary is *not* attached proximally to CuP (Phillips 1930: Pl. 62 3; Mosely 1932: Pl. II 10), and in the possession of femoral bars on the forelegs but *not* the middle and hindlegs; the penes at first closely resembled Phillips' figure (1930: Fig 11) except that the apical cleft appeared much shorter, but after treatment with KOH there proved to be almost no apical cleft, and the characteristic apical "cups" and spines (not figured by Phillips) proved to be present. As for *Z.* (*Z.*) *borealis*, its author clearly found it an unremarkable New Zealand "Atalophlebia" and his description of the gills marks it as belonging to *Zephlebia* and not *Neozephlebia*; (Mr D. E. Kimmins points out (pers. comm.) that Phillips was incorrect in assuming that, because the adult was unknown, his (Phillips 1930: 356) description and naming of the nymph would have no nomenclatural force.) The case of *Z.* (*N.*) *nodularis* has already been discussed. No New Zealand species now remains in *Atalophlebia*.

The very characteristic penes (Figs. Z2, Z3, Z5) of the new genus at once distinguishes it from all known Leptophlebiidae from other regions. The genus with which *Zephlebia* is most

likely to be confused is *Atalonella*, from which it is distinguishable not only by the penes but also by the very strong crossveins (weaker in *Atalonella*, tending to absence in the basal half of the costal area) and the divergence of the cubital intercalaries (concentric in *Atalonella*). These characters in the latter genus are figured by Demoulin (1955) and Tillyard (1936: as *Atalophlebia brunnea*, *A. fuscula* and *A. delicatula*, all since transferred to *Atalonella*). The most zephleboid overseas species appears to be the Tasmanian *Atalophlebia ida* Tillyard, here considered *not* to belong to *Atalophlebia* (restr.), but the male imago and the nymph remain undescribed which renders a worthwhile comparison difficult.

When the southern Leptophlebiidae are better understood, it is very possible that both *Zephlebia* and *Neozephlebia* will come to be regarded as subgenera of *Atalophlebia*, and that a new subgenus or genus may have to be erected for the Chilean species now in *Atalophlebia* by those who have access to ample material. Thanks to the great kindness of Dr. Jay R. Traver, of the University of Massachussetts, who supplied a male imago, and to the admirable figures of Dr. G. Demoulin (1955), the writer is able to draw attention to the homogeneity of the Chilean species as to absence of fusion in the penes, shortness of the stem of MP in the hindwing, and path of CuP (proximally parallel to CuA) in the forewing, characters which differ very markedly from those of the Tasmanian genotype *A. australis*. The tips of the penes defy concise verbal description, but are nevertheless recognisably peculiar to Chile, and homogeneous throughout the known species.

Alcoholic series of the nymphs and adults of the two new genotype species have been presented to the Canterbury Museum, Christchurch, and to the British Museum (Natural History), London, where Mr. D. E. Kimmins very kindly compared them with the types, confirmed the identifications and prepared a sketch of the venation of the type of one of them (Fig. N1). Additional series have been sent to the Entomology Division of the D.S.I.R. in Nelson, the California Academy of Sciences, the Institut Royal des Sciences Naturelles de Belgique, the Entomology Division of the C.S.I.R.O. at Canberra, and to a number of workers known to be investigating the Paleantarctic Leptophlebiidae.

References

Demoulin, G., 1955. Ephéméroptères nouveaux ou rares du Chile. *Bull. Inst. Sci. nat. Belg.* 31 (22), 31 (58), 31 (73).

Eaton, A. E., 1899. An annotated list of the Ephemeridae of New Zealand. *Trans. ent. Soc. Lond.* 1899: 285-293.

Edmunds, G. F., Jr., 1957. The systematic relationships of the paleantarctic Siphlonuridae (including Isonychiidae) (Ephemeroptera). *Proc. ent. Soc. Wash.*, LIX.

Hudson, G. V., 1904. *New Zealand Neuroptera.* West, Newman and Co.

KIMMINS, D. E., 1960. The Ephemeroptera types of species described by A. E. Eaton, R. McLachlan, and F. Walker. *Bull. Brit. Mus. (nat. Hist.) Ent.* 9, 4.

MOSELY, M. E., 1932. The New Zealand Mayflies. *Salm. Trout Mag.*, 69 (Dec.)

PHILLIPS, J. S., 1930. A revision of New Zealand Ephemeroptera. Part 2. *Trans. N.Z. Inst.* 61: 335-390.

TILLYARD, R. J., 1926. *The Insects of Australia and New Zealand.* Angus and Robertson.

——— 1934. The Trout-Food Insects of Tasmania. Part I. A Study of the Genotype of the Mayfly Genus *Atalophlebia* and its Life History. *Pap. roy. Soc. Tasm.* 1933.

——— 1936. The Trout-Food Insects of Tasmania. Part II. A Monograph of the Mayflies of Tasmania. *Pap. roy. Soc. Tasm.* 1935.

TRAVER, J. R., 1946. Notes on Neotropical Mayflies. Part I. Family Baetidae, Subfamily Leptophlebiinae. *Rev. de Entomologia* 17, 3.

The Occurrence of the Tasmanian Grass Grub *Aphodius tasmaniae* Hope (Coleoptera: Aphodiinae) in Auckland

By BRENDA M. MAY

Plant Diseases Division, Department of Scientific and Industrial Research, Auckland.

Summary

Aphodius tasmaniae Hope, known in New Zealand as the Tasmanian Grass Grub, is here recorded as occurring in Devonport, Auckland. Climatic factors affecting distribution are discussed and characters for separating the larvae from those of two common grass grubs *Costelytra zealandica* (White) and *Heteronychus sanctae-helenae* Blanch. are given.

Introduction

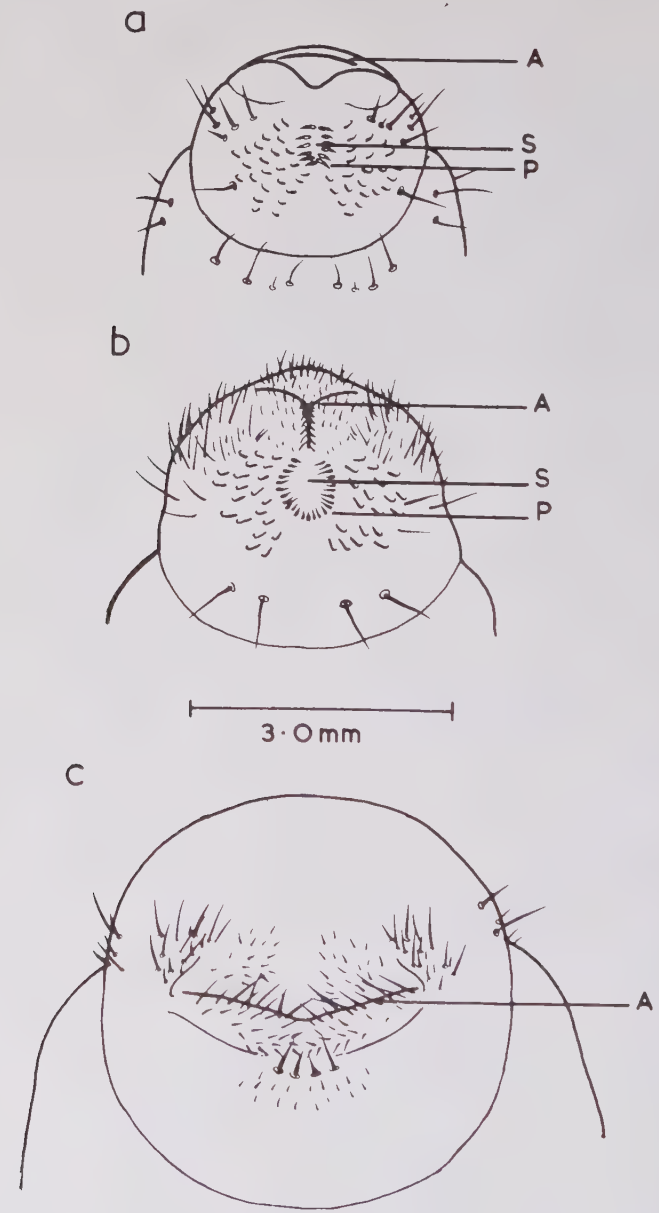
Aphodius tasmaniae (previously known as *A. howitti* Hope (Given, 1958)), is a pasture pest of some importance in the south-eastern parts of Australia (Given, 1950; Carne, 1956) and the northern parts of Tasmania (Martyn, 1956). The earliest specimen collected in New Zealand is dated January, 1920 (collector unknown) from the Hoon Hay Valley near Christchurch. In the Brookes Collection at Plant Diseases Division other early records are as follows: 8/11/1922, Hoon Hay Valley, collector unknown, 3 sp.; 5/1/1923, Hoon Hay Valley, collector unknown, 1 sp; 8/11/1923, Hoon Hay Valley, S. Lindsay, 2 sp.; 8/11/1923, Hoon Hay Valley, E. Clark, 5 sp.; 1925, Whangarei, E. Fairburn, 1 sp.; undated (prob. 1920's), Ohakune, T. R. Harris, 1 sp.

Cottier (1956) describes the species as being a minor pest in Canterbury in lawns and golf courses as well as in pasture, but there is no record of pasture damage in the North Island.

Recent Occurrence

The beetles have appeared this year at Devonport, Auckland. Two adults were caught at light in a house on February 22, 1961, and larvae were dug from a garden in King Edward Parade on May 5, 1961. Subsequently, on June 21, in the same garden, it was found that final instar larvae were abundant in the soil at a depth of 6 to 8 in. and burrow entrances were well distributed at soil level. From aproximately 3 cu. ft. of soil examined, 22 larvae of *Aphodius tasmaniae,* 8 of the grass grub *Costelytra zealandica* and 2 of the white-fringed beetle *Graphognathus leucoloma* were taken. The soil type was light and sandy. The lawn of grass and Mercury Bay Weed (*Dicondra repens*) was severely damaged.

The burrows of *A. tasmaniae* were also seen in the grass verge across the road on the waterfront, the soil here being sandy loam on top of compact shingle.



Climatic Factors

The specimen in the Brookes Collection captured at Whangarei suggests that the beetle has probably been present north of Auckland for at least 36 years. It has not become established as an economic pest, perhaps because of unsuitable climatic conditions.

In Tasmania, the occurrence of *A. tasmaniae* is associated with localities having the higher mean summer and winter temperatures. The species is abundant where the summer mean is 60.2°F and winter mean 50.8°F (Martyn, 1956). Auckland temperatures would be completely favourable, with summer mean of 65.5°F and winter mean of 52.3°F.

Carne (1956) suggests that in Australia, the susceptibility of larvae to death from disease or combat for food is increased by wet conditions. Populations increase in years of lower than average rainfall and also when rainfall is evenly distributed during larval stages in the winter months. An example showing the correlation between dry years and subsequent high densities is given from an area with an annual mean rainfall of 29.57 in. (varying from 20.69 in. to 43.31 in. over a period of 5 years). Auckland has an annual mean of 53.58 in. and a wide variation (38.31 in. to 75.47 in. over a period of 10 years). In the Auckland area therefore, and probably further north, it seems likely that the high and unevenly distributed rainfall is a limiting factor to any large build up of population. If Carne's suggestion is correct, the "peaks" of rainfall occurring in the winter months, when larvae are active and later pupating, would be particularly destructive to them. This theory is borne out in recent investigations by Maelzer (1961) who states, "In wet winters, vast numbers of third instar larvae are drowned when extensive flooding occurs on poorly drained soils and on well drained soils a large proportion of larvae are killed by the entomophagous fungus *Cordyceps aphodii.*"

	A. tasmaniae	*C. zealandica*	*H. sanctae-helenae*
Head	Dark brown to black	Yellowish with mandibles dark brown at apex only	Light brown with dark brown mandibles
Prothoracic segment	Small pigmented areas laterodorsally	Unpigmented	Unpigmented
Raster	Pali spatulate Approx. 12 forming an ovoid septula	Pali acuminate Approx. 26 forming a sub-circular septula open at anal end.	Pali not evident
Anal slit	Transverse; bare of setae	Y shaped; densely setose	Transverse; setose

Identification of Larvae

Larvae of *Aphodius tasmaniae* are probably less well known than those of *Costelytra zealandica* and the Black Beetle *Heteronychus sanctae-helenae* which occur in a similar habitat. Characters are given for the separation of third (final) instar larvae of the three species (Fig. 1).

The author wishes to acknowledge the help and co-operation of Mr. J. S. Say, of the Department of Agriculture, Auckland, and Mr. B. B. Given, of Entomology Division, Nelson.

References

Carne, P. B., 1956. An Ecological Study of the Pasture Scarab *Aphodius howitti* Hope. *Aust J. Zool* 4: 259-314.

Cottier, W., 1956. "Plant Protection in New Zealand" (R. E. Owen. Government Printer, Wellington).

Given, B. B., 1950. Notes on the Aphodiinae of Australia (Coleoptera. Scarabaeidae). *Pro. Linn. Soc. N.S.W.* 75 (3-4): 153-7.

———1958. A Note on the Status of *Aphodius tasmaniae* Hope. *Proc. Linn. Soc. N.S.W.* 83 (2): 196.

Maelzer, D. A., 1961. The Effect of Temperature and Moisture on the Immature Stages of *Aphodius tasmaniae* Hope (Scarabaeidae) in the Lower South-East of South Australia. *Aust. J. Zool.* 9 (2): 173-202.

Martyn, E. J., 1956. The Distribution in Tasmania of *Aphodius howitti* Hope. and *A. pseudotasmaniae* Given, in Relation to Climate. *Tasm. J. Agric.* 27: 391-404.

Explanation of Text Figures

Fig. 1: Anal segments of a. *Aphodius tasmaniae* Hope; b. *Costelytra zealandica* (White); c. *Heteronychus sanctae-helenae* Blanch. Abbreviations used in Fig 1: A, anal slit; S, septula; P, pali.

Aphodius tasmaniae Hope in Canterbury

By A. D. LOWE
Entomology Division, Lincoln.

From time to time this insect is reported in Canterbury, and the following appear to be the available records: A specimen from Hoon Hay, Christchurch, in the Brookes Collection, Plant Diseases Division, D.S.I.R., is dated 1920. The Canterbury Museum collection contains four specimens of adults collected by S. Lindsay from Hoon Hay, Christchurch, 8/2/23. Auckland Museum is reported to contain similar specimens. Mr. E. S. Gourlay reports verbally that he was present when these insects were collected and that there had been a large flight. Other single specimens from Canterbury Museum collected by S. Lindsay, are labelled Okuti Valley, 29/1 33, and Prices Bush, 30/1 48. Both these areas are on Banks Peninsula.

The Department of Agriculture at Christchurch reported a large flight at Spotswood, 25/2/43. A subsequent visit by Mr. L. J. Dumbleton, Entomology Division, revealed larvae infesting river flats adjacent to the Main North Road bridge over the Waiau River. In February, 1946, Mr. Dumbleton records that he inoculated larvae in this area with a culture of the nematode *Neoaplectana glaseri* (Steiner), with negative results.

In February, 1951, the Instructor in Agriculture at Christchurch reported that there had been large flights at Harewood, Christchurch, and at Waiau. About the same period officers of the Entomology Division had large flights in the Waiau-Rotherham area verbally reported to them, but no specimens were submitted for identification. A search of likely sites failed to reveal any larval infestation in March, 1951.

The Horticulture Division, Christchurch, maintains a small insect collection of specimens submitted by the public of Canterbury for identification. This includes several unlabelled specimens of this beetle.

On 3/3/60, 2 adults of this species were taken on an aphid grease trap at Ashley Dene, near Lincoln, by Mr. C. T. Jessep.

Mr. J. M. Kelsey found numerous larvae of this species at Ellesmere Spit, Canterbury, in September, 1960. Many of these were infected with a fungus, which was identified by Miss J. M. Dingley of Plant Diseases Division, Auckland, on 3/10/60, as *Cordiceps aphodii*, a disease described by Mathieson (1949). On 13/1/61, Mr. C. T. Jessep took two adults from soil in the same area.

On February 2, 1961, the "Christchurch Press" carried a report which, in part, read as follows: "Christchurch was invaded by

small black beetles last evening. Thousands of them buzzed under lights, and in places footpaths were a black crawling mass. In parts of Cathedral Square the street was wet and slippery where the beetles had been squashed to pulp by cars. Theatre-goers leaving theatres at 10.30 p.m. flapped their clothing as they passed through clouds of the bettles." Specimens submitted to Entomology Division were identified by Mr. L. J. Dumbleton as *Aphodius tasmaniae* (Hope). A report on local weather appearing in the same paper said: "Yesterday was the hottest day in Christchurch this year, with temperatures ranging from 65° at 8 a.m. to a maximum of 88° at 1.30 p.m., and remaining high to read 75.3° at 9 p.m. Humidity readings were 31% at 2 p.m. and 34% at 4 p.m."

During the week following, several specimens were taken at light by the present author in the Christchurch suburb of Riccarton.

We are indebted to those who made these records available. They suggest that this species is widely established in Canterbury, with populations high enough to give rise to occasional noticeable flights of adults.

Reference

Mathieson, J., 1949. Trans. Brit. Mycol Socy. 32, 113-136.

Larvae of Three Aquatic Beetles (Coleoptera: Dytiscidae)

By K. A. J. WISE,
Plant Diseases Division, Department of Scientific and Industrial Research, Auckland.

During a study of Chironomid midges at Mangere, Auckland, aquatic larvae and beetles of *Bidessus plicatus* Sharp and *Antiporus duplex* Sharp (Family Dytiscidae) were found in freshwater seepage pools. The Dytiscid *Hyphydrus elegans* Mont. var. *nitidicornis* Broun was collected from water-troughs at Mangere and a seepage

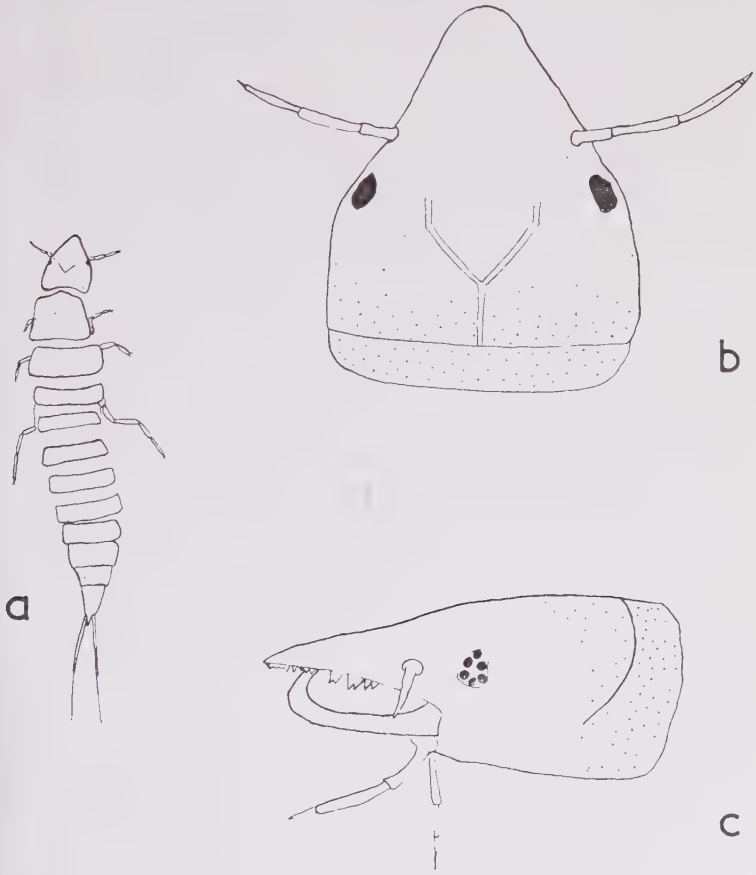


Fig. 1.

Fig. 1: *Bidessus plicatus* Sharp a. larva, dorsal view; b. head, dorsal view; c. head, lateral view.

Bidessus plicatus Sharp (Fig. 1)

pool at Sunnyvale, Henderson. Larvae of these three species are herein described and figured, descriptions being mainly based on mature larvae. Larvae have been determined by association with adults and/or by breeding of adults, which have been identified by Mrs. B. M. May, Plant Diseases Division.

Hudson, 1934, described and figured an *Antiporus* larva under the name of "*Bedessus plicatus*." His figure has the appearance of an immature specimen.

Head: Pale ochreous anteriorly, light fuscous posteriorly, antennae with apical two segments darker than basal two. Produced in a triangular process not as long as head itself. *Process* straight and almost in line with top of head, bears ventral teeth on lateral edges. *Mandibles* upcurved. *Antennae* 4-segmented, *maxillary palpi* 3-segmented, *labial palpi* 2-segmented. *Eyes* prominent.

Thorax: Pronotum large, pale fuscous with ochreous lateral patches. *Meso-* and *meta-nota* pale fuscous. Thoracic segments fleshy below—sternites not sclerotised. *Legs* with 5 segments: coxa long, a 2-segmented trochanter, femur, tibia, and tarsus with a pair of claws. All legs pale fuscous except for pale ochreous patch at base and apex of coxa.

Abdomen: Tergites of abdominal segments 1-6 pale fuscous. Sternites of abdominal segments 1-6 fleshy, not sclerotised. Sclerites of abdominal segments 7, 8 completely sclerotised, circular about abdomen; segment 7 pale fuscous, segment 8 testaceous. Median caudal *respiratory horn* very short, approx. half length of segment 8. A pair of moderately long caudal processes (*urogomphi*); pale ochreous.

Length (head-respiratory horn): 4 mm.

Larvae collected February, March, September.

Antiporus duplex Sharp (Fig. 2)

Head: Pale yellow with dark ochreous mark on each side of frons and extending over head enclosing several pale yellow spots. Produced in a long spatulate process not as long as head itself. *Process* curved in lateral view, base and apex in line with top of head, middle portion arced above; with a pair of lateral projections almost at half-way, narrowed beyond; a pair of small ventral projections almost at a quarter from base. *Mandibles* strongly upcurved. *Antennae* 4-segmented, *maxillary palpi* 3-segmented, *labial palpi* 2-segmented. *Eyes* prominent.

Thorax: Pronotum dark ochreous with paler ochreous area or spots posteriorly. *Meso-* and *meta-nota* with variable light spots. Thoracic segments fleshy below sternites not sclerotised. *Legs*

with 5 segments; coxa long, narrow, a 2-segmented trochanter, femur, tibia, tarsus with a pair of long narrow claws. Anterior and middle legs pale ochreous, tibia and tarsus slightly darker. Posterior legs, coxa ochreous, remaining segments pale ochreous.

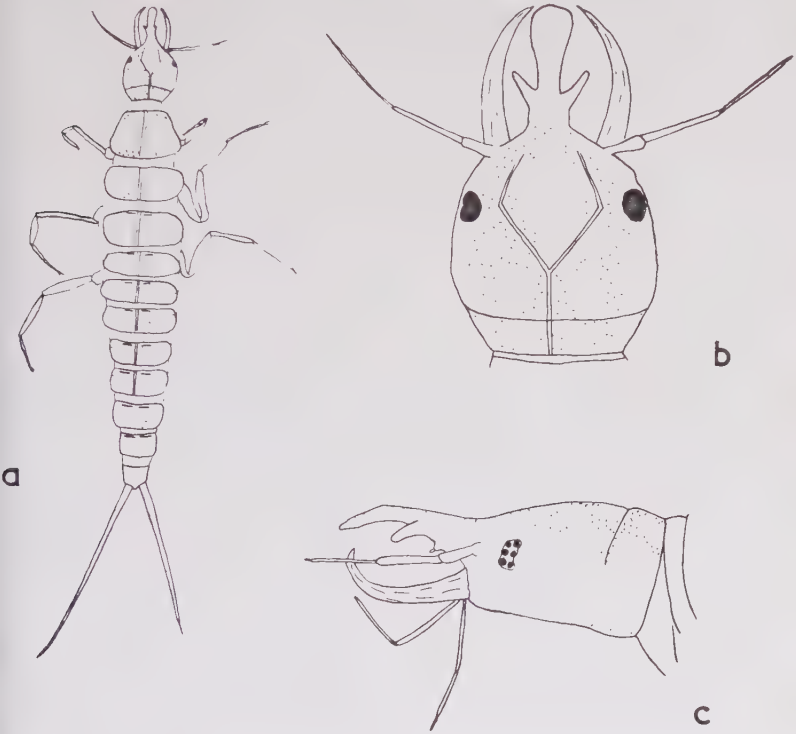


Fig. 2.

Fig. 2: *Antiporus duplex* Sharp a. larva, dorsal view; b. head, dorsal view; c. head, lateral view.

Abdomen: Tergites of abdominal segments 1-6 slightly patterned in shades of grey or brown. Sternites of segments 1-6 fleshy below, not sclerotised; numerous setae, each arising from a sclerotised spot, give stippled appearance. Sclerites of segments 7, 8 completely sclerotised, circular about abdomen; slightly patterned in shades of grey or brown, pale ochreous below. Caudal *respiratory horn* absent. A pair of long setose caudal processes (*urogomphi*) little more than half as long as abdomen in final instar but variable, longer in early instars; basal third ochreous, middle third pale ochreous, apical third fuscous.

Length (head-abdominal segment 8): 10 mm.

Larvae collected September, November, December.

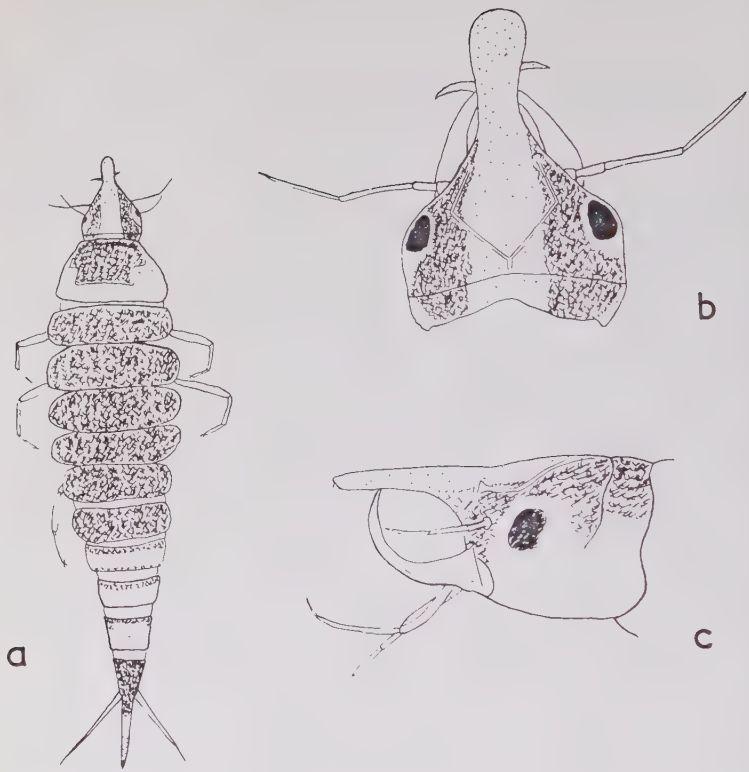


Fig. 3.

Fig. 3: *Hyphydrus elegans* Mont. var. *nitidicornis* Broun a. larva, dorsal view; b. head, dorsal view; c. head, lateral view.

Hyphydrus elegans Mont. var. *nitidicornis* Broun (Fig. 3)

Head: Pale yellow with light olive longitudinal band on each side from base of spatulate process passing above eyes, outlines irregular. Produced in a long narrow spatulate process as long as head itself. *Mandibles* strongly upcurved. *Antennae* 4-segmented, *maxillary palpi* 3-segmented, *labial palpi* 2-segmented. *Eyes* prominent.

Thorax: Pronotum large, pale yellow with olive median anterior patch which spreads laterally on anterior edge without reaching lateral edges. *Meso-* and *meta-nota* olive. Thoracic segments fleshy below—sternites not sclerotised. *Legs* with 5 segments; coxa very large, a 2-segmented trochanter, femur, tibia, and tarsus with a pair of long narrow claws. Anterior legs pale yellow, no markings. Middle legs pale yellow, pale olive broad median band on coxa and narrow basal band on tibia and tarsus.

Posterior legs, coxa pale olive, remaining segments pale yellow, tibia and tarsus with narrow pale olive basal bands.

Abdomen: Tergites of abdominal segments 1-4 olive, 1 and 2 with small central pale yellow patch; tergite 5 pale yellow with olive bands on anterior and posterior edges. Sternites of abdominal segments 1, 2, 3, fleshy below, not sclerotised; on segments 2, 3, numerous setae, each arising from a sclerotised spot, give stippled appearance; sternite of abdominal segment 4 sclerotised, olive; sternite of abdominal segment 5 sclerotised, pale yellow with anterior edge olive. Sclerites of abdominal segments 6, 7, 8, completely sclerotised, circular about abdomen; segments 6, 7, pale yellow above with narrow band of olive on anterior edge, pale yellow below; segment 8 almost black above, dark olive below. Median caudal *respiratory horn* tapering to apex, moderately long; almost black at base shading to light orange before apex, apex light olive. A pair of caudal processes (*urogomphi*) approx. same length as horn; almost black at base shading to light orange at apex.

Length (head-respiratory horn): 8 mm.

Larvae collected November, December.

Reference

Hudson, G. V., 1934. *New Zealand Beetles and their Larvae.* Ferguson and Osborn, Wellington. 236 pp.

Eggs of Phasmid Species in the North Island

By R. A. CUMBER,

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When searching through leaf-mould samples from forested areas, one may often encounter the eggs of "stick insects." These are by no means always obvious, since in sifting, they usually reach the sample which contains frass materials of similar proportions and size—a feature which might well bestow survival value.

During the past five years, a selection of these eggs has been kept, and the variation in form and sculpturing is quite impressive. This variation, coming as it does in the egg stage, must be of considerable systematic significance.

The literature on New Zealand phasmids up to 1952 is indicated by Miller (1956). Salmon (1954, 1955 a-c) has made further contributions. There is little reference to the character of the eggs, however.

It would be of considerable interest to know which species are involved in the eggs pictured in the present paper. Doubtless further distinctive egg forms are present in this country—especially in the South Island, and high country areas. Studies may well show characteristic egg forms in the different genera. Adults taken during the summer months and held in captivity for short periods may be expected to oblige, and so help unravel this fascinating facet of our entomology.

References

Miller, D., 1956. Bibliography of New Zealand Entomology. *N.Z. Dep. Sci. Industr. Res. Bull.* 120: 492 pp.

Salmon, J. T., 1954. A New Genus and Species of Phasmidae from New Zealand. *Trans. Roy. Soc. N.Z.* 82: 161-68.

1955a. The Genus *Acanthoxyla* (Phasmidae). *Ibid.* 82: 1149-56.

1955b. Parthenogenesis in New Zealand Stick Insects. *Ibid.* 82: 1189-92.

1955c. Stick Insects. *Tuatara* 5 (3): 77-81.

Phasmid egg capsules from leaf-mould samples: 1. Kahuterawa, Northern Tararua Range, 27/4/61; 2. Wharite, Southern Ruahine Range, 3/9/58; 3. Ballance Bridge, Manawatu Gorge, 28/1/59; 4. Waitakere Range, 3/9/58; 5. Mangamuka Gorge, Northland, 23/2/59; 6. Aorangi Mountains, Wairarapa, 24/1/59; 7. Waiare, near Kaeo, Northland, 19/9/58; 8. Wharite, Southern Ruahine Range, 3/9/58; 9. Wimbledon, Southern Hawke's Bay, 26/11/57.

Photograph Miss M. Soulsby.

First Record of the Occurrence of *Dactylosternum abdominale* (F.) (Coleoptera: Hydrophilidae) in New Zealand

D. H. TODD,
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The occurrence in New Zealand of *Dactylosternum abdominale* (F.) is here recorded for the first time. The species was found in association with the biting fly, *Stomoxys calcitrans* (L.) in uncovered ensilage stacks in the Auckland district.

On February 9, 1960, the writer noted that a species of hydrophilid occurred commonly in two uncovered ensilage stacks situated near Karaka in the Franklin County, Auckland district. During the preceding 2 months, these stacks generally, had been heavily infested with *Stomoxys* larvae. By February 9, however, *Stomoxys* larvae were almost completely absent. As there was evidence to indicate that optimum breeding conditions for the biting fly still prevailed in the stacks, the hydrophilid was suspected of feeding on the immature stages.

Specimens of the adult beetle were sent to Mr. E. S. Gourlay, Entomology Division, Nelson, who kindly submitted them to the Commonwealth Institute of Entomology, London, where they were identified as *Dactylosternum abdominale* (F.).

Since the first record of *D. abdominale* near Karaka in 1960, the insect has been found to occur in other parts of the Auckland district. During February, 1961, adult beetles were recovered from ensilage stacks situated as far south as Te Awamutu. An examination of a number of stacks beyond this point, failed to reveal the presence of the insect. It has been observed that high population levels of the beetle only occur in stacks where conditions of extreme putrefaction exist.

A review of the available literature in New Zealand revealed little information in respect to *D. abdominale*. Therefore, much of the information given here has been kindly supplied by a number of overseas colleagues, who have access to literature on the subject, and who in some cases, have studied other species of *Dactylosternum*.

Regarding *D. abdominale*, Horn (1890) states, "The species seems to be a native of Brazil, whence it has spread to the Antilles and Mexico, and in the Eastern Hemisphere to Madeira and Madagascar. The specimens seen from our fauna are from Florida and North Carolina."

Woolaston (1865) in reference to *D. abdominale* reports "An insect of the Mediterranean latitudes, and widely spread over these Atlantic Islands. Possibly indeed, it will be found to be almost universal—its habitat, amongst putrid substances generally (whether vegetable or animal), enabling it to attach itself to many different kinds of localities. It is found usually at low elevations, about towns and gardens. Thus at the Madeirean Group it is occasionally common in the immediate vicinity of Funchal, amongst filthy *rejectamenta* (such as the empty shells of crabs, etc.) in the neighbourhood of the drains and sewers; whilst at the Canaries it more often attacks the putrid leaves of the Prickly Pear (*Opuntia tuna*, Mill.) which have been thrown away to rot, as well as the various accumulations in the yam-grounds."

Corbett (1936) reports *D. abdominale* to occur in banana stumps in the Federated Malay States in 1936.

Clausen (1940) states that "*Dactylosternum abdominale* (F.) was recently imported into Jamaica in efforts to control the banana borer *Cosmopolites sordidus* Germ."

Dr. C. E. Pemberton (pers. comm.) says, "I have studied several species of *Dactylosternum*, which I found in decaying vegetable material (mostly banana stumps) in the Philippines, Borneo, Java and Celebes. . . . The larvae of all the species I studied are predators on the larvae of other insects." *D. abdominale* was not included in Pemberton's studies of hydrophilid beetles in the Malay archipelago, but it can be reasonably assumed that this species is also predacious.

Dr. D. F. Waterhouse (pers. comm.) advises that as far as can be determined, *D. abdominale* is not in Australia and there does not appear to be any records of it having been introduced into that country. Waterhouse also mentions that in Hawaii, *D. abdominale* appears to be well established, and he states that a review of the available literature suggests that it has been there for over 30 years. Apparently little or nothing is known concerning its origin or circumstances surrounding its introduction to Hawaii.

Mr. B. A. O'Connor of the Department of Agriculture, Fiji (pers. comm.) has a record of *D. abdominale* having been taken in rotting pumpkin.

From the cited literature, it is apparent that attempted control of insect pests by *D. abdominale* has had a rather limited application, and that introductions of the insect from one country to another have been comparatively few.

In recent years, the increasing incidence of the biting fly, and its attacks on dairy herds in New Zealand, has been causing grave concern to the dairying industry. Investigations carried out on

this urgent problem, have shown that in rural areas, uncovered ensilage stacks generally, are the main breeding sites of the pest. Although there is evidence to suggest that *D. abdominale* is a predator of the biting fly in ensilage stacks, the ultimate effect of the insect on *Stomoxys* populations occurring in these situations, has yet to be determined.

References

Clausen, C. P., 1940. Entomophagus Insects. McGraw-Hill Book Co. Inc., New York and London, 536 pp.

*Corbett, G. H., 1936. Division of Entomology Annual Report for Year 1935. *Gen. Ser. Dept. Agr. S.S. and F.M.S.* 24: 41-53.

*Horn, G. H., 1890. A Revision of the *Sphaeridiinae* Inhabiting Boreal America. *Trans. Amer. ent. Soc.* 17: 279-314, vide p. 283-4.

*Woolaston, T. V., 1865. Coleoptera Atlantidum. Insects of the Madeiras, Salvages and Canaries. London. 140 pp., vide p. 80.

* Original not seen.

Notes and New Records of Exotic Ants Introduced Into New Zealand

R. W. TAYLOR,
Biological Laboratories, Harvard University*

Since the recent publication of W. L. Brown's "Review of the Ants of New Zealand" (1958), three additional exotic formicids have been recorded from this country. These are: *Ponera leae* Forel (Taylor, 1960), *Pheidole yarrensis* Forel (Cumber, 1959) and *Iridomyrmex darwinianus* (Forel) (Taylor, 1959); all of Australian origin. The two former species are of special interest as their distributions appear to be restricted to the Bay of Islands area. *Ponera leae* is known only from the immediate vicinity of Paihia, where it has been collected in Berlese funnel samples of leaf mould. *Pheidole yarrensis* is present also at Paihia (Cumber, 1959) and has been taken at Haruru Falls (February 4, 1959; R. W. Taylor) and Kerikeri (January 17, 1956; K. A. J. Wise); Cumber recalled having seen this species at Kaikohe some years ago. These distribution patterns may indicate that the ants concerned have been derived from propagules introduced directly into the Bay of Islands district by man. Neither of these species is a regular associate of human settlements or commodities, and the highly cryptobiotic *P. leae* in particular would seem unlikely to be carried on normal cargoes. It is probable that both forms were introduced in soil ballast during the early days of European settlement, when Bay of Islands ports were important trade termini. Further search in Northland could well expose other similar elements in the ant fauna.

Iridomyrmex darwinianus, on the other hand, represents one of the many ant species which have reached New Zealand on more recent cargoes, notably on Australian timber, or other stocks in trade (especially fruit and vegetables) from elsewhere. In the following paper a number of species are discussed, most of which are probably also recent introductions. Six of these ants are recorded from New Zealand for the first time. An attempt is made to assess the pest potential of these species, and in some cases their possible modes of entry into the country are discussed. The interception records cited in this respect have been gathered as part of an associated study based on the known records of apprehension of exotic ants at New Zealand ports; a summary of this work is in the final stages of preparation.

A large part of the material discussed below was collected by the author. Many records have been derived from the collections of the Plant Diseases Division, Auckland: the N.Z. Plant Quarantine

* Previously of the Zoology Department, University of Auckland.

Service, Wellington; and the Forest Research Institute, Rotorua. I wish to thank Dr. K. P. Lamb, Mr. D. C. M. Manson, and Mr. R. Zondag of these institutions for allowing the study of this material. Reference series of the species discussed will be placed in all three collections.

Subfamily Ponerinae

1. *Rhytidoponera metallica* (Fr. Smith).

Material examined. Penrose Railway Yard, Auckland, a number of series from nests under timber and stones, February 3, 1959; April 23, 1959 (R. W. Taylor).

This species is of Australian origin and has probably been introduced into New Zealand on cargoes of timber, from which a number of the smaller *Rhytidoponera* have been collected, including: *R. aspera* (Roger), *R. victoriae* Andre (Brown, 1958) and *R. chalybaea* Emery (see below). *R. metallica* itself has been collected at an Auckland wharf on sawn timber imported from Goff's Harbour, Australia (June, 1959, M. Lay). The species was recorded as an introduction into Samoa by Wheeler (1935a), but does not appear to have become established there.

In Australia this is the common "greenhead ant," one of the most widespread of all insects. It has wide ecological tolerance, being found mainly in moderately wooded or open areas, and it has been taken in the parks and gardens of some of the larger cities. *R. metallica* constructs small, rather loosely integrated nests, usually among grass roots or beneath logs or stones. It is a diurnal forager and feeds on a wide variety of insects and other small arthropods. Indeed, it has been considered beneficial in some areas, where its prey consists of a high proportion of agricultural pests (especially larval Coleoptera and Lepidoptera) and termites (Fell, 1940).

Little biological information is available concerning the New Zealand samples of this species. The nests are typical, and some of those examined contained insect remains. Winged males were taken from one colony on February 3, 1959. The most seriously undesirable feature of *R. metallica* is its highly potent sting. The Penrose population appears to be prospering and the species is almost certainly permanently established there.

2. *Rhytidoponera chalybaea* Emery.

Material examined. Otara, Auckland, a number of workers collected foraging on a clay bank, March 20, 1960 (R. Moynihan). Napier, Hawke's Bay Power Board pole dump, August 28, 1959, 5 workers (A. P. Richardson).

These two records, from such widely spaced localities, very probably indicate that *R. chalybaea* is firmly established in New

Zealand. It is entirely possible, however, that both recorded populations have been derived from separate immigrant stocks, as this species has been taken on at least two occasions from timber cargoes originating in Australia. It was reported by Manson (1959) as an interception from Australian hardwood poles, at Invercargill, and has also been collected from Australian sawn timber landed at Auckland (November 5, 1958; C. Crapp).

The Napier specimens were taken in an old established dump used for the storage of power poles imported from Australia. If *R. chalybaea* has sucessfully invaded this area it will almost certainly have succeeded in spreading elsewhere in Hawke's Bay. The Otara specimens are from a locality about four miles from the Penrose site where *Rhytidoponera metallica* was collected (see above).

The natural range of *R. chalybaea* is apparently restricted to forested areas of the narrow eastern "wet strip" of Australia, from just north of Brisbane to southern Victoria (Brown, 1954). The records listed above indicate that it must be common in some timber milling areas regularly supplying poles and sawn timber for export to New Zealand. The nests are usually located in rotten logs or wood fragments, but may be found in the soil under stones. Colonies are small, usually with less than 250 workers (Brown, 1954). There is little available information on feeding or foraging habits, but the above remarks concerning the possible economic significance of *Rhytidoponera metallica* can very probably be applied equally to *R. chalybaea.*

3. *Brachyponera luteipes* (Mayr).

Material examined. Penrose, Auckland, 2 workers collected from a timber yard, April 23, 1959 (R. W. Taylor).

As Brown (1958) has commented, there is considerable taxonomic confusion among the *Brachyponera* of South-Eastern Asia, Melanesia and Northern Australia. In naming the specimens recorded above I have followed Wilson's recent (1958) concept of *B. luteipes,* and concur with him the strong possibility that *B. croceicornis* Emery represents a synonymous Melanesian and Australian variant of this widespread Asian species. The specimens before me compare well with material in the Harvard Museum of Comparative Zoology collection from India, China and Japan, which was determined as *B. luteipes* by Wilson at the time of his study. I would venture the opinion that the New Zealand introduction has probably been derived from a Japanese sample of the *luteipes-croceicornis* complex. The Penrose specimens certainly do not resemble typical Australian examples, which are presently assigned to *B. croceicornis,* and it seems unlikely that their progenitors originated in Australia.

The specimen recorded from Waikino by Brown (1958) as *B. chinensis* (Emery) will almost certainly prove to be conspecific

with those recorded above, for, as Brown has suggested, *B. chinensis* is probably also a synonym of *B. luteipes*. This further record may indicate successful establishment of *B. luteipes* in New Zealand. It seems unlikely that the species will prove to have economic significance.

Subfamily Myrmecinae

4. *Pheidole megacephala* (Fabricius).

Material examined. Newmarket, Auckland, a large sample from a chocolate factory, February 10, 1952 (D. Spiller and J. M. Kelsey). Richmond, Auckland, numerous specimens from a garden and from a food cupboard in a nearby house, January, 1959 (G. Cronin and R. W. Taylor).

This is one of the most widespread and economically important of all pest ants. It invades houses and stores and will tend homopterans injurious to garden and orchard crops. *P. megacephala* is found in most of the tropical and warm temperate parts of the world, and is widespread in the Pacific Islands (Wheeler, 1935a), and Australia (Clark, 1941). It also occurs as a pest in many parts of Europe and North America.

Judging from the above records this ant appears to be well established in the Auckland area, and to have been present there for some years. Both of the reported samples were collected from quite intensive, but very local infestations, and the species has apparently been unable to break out extensively. It could be that *P. megacephala* is climatically limited at the latitude of Auckland, or it may well be suppressed by competition with the strongly established Dolichoderine pests *Iridomyrmex glaber* (Mayr) and *Technomyrmex albipes* (Fr. Smith).

P. megacephala is fairly regularly encountered by port quarantine officers, and has been taken mainly on fruit or flowers from the Pacific Islands or Australia (Brown, 1958; Jacks, 1954; Laird, 1951; Manson, 1958, 1959). In view of the large number of recorded interceptions, and the obvious adaptability of this species, its occurrence in New Zealand is not surprising. Further outbreaks would justify the attention of control officers.

5. *Pheidole variabilis* Mayr.

Material examined. Takapuna, Auckland, six specimens from soil, May, 1959 (M. Meikeljohn); several series from soil in a garden, April, 1958, December, 1959 (A. Graham).

P. variabilis is a highly variable, and apparently fairly adaptable species, endemic to eastern Australia. It was reported by Brown (1958) as an interception from an Australian cargo at an unspecified New Zealand port. Although the above samples were taken from a limited area they nevertheless appear to indicate the presence

of an established population of this ant at Takapuna. One of the collectors, Mr. A. Graham, reported the species as very abundant in a domestic vegetable garden where its nests were common in the disturbed soil of cultivation plots. Little is known concerning the biology of *P. variabilis*, it has not been reported as a house pest, but very probably attends aphides and other homopterans. This species certainly deserves investigation as a possible pest.

6. *Monomorium pharaonis* (Linnaeus).

Material examined. Auckland, several specimens collected from food, June 2, 1955 (Auckland City Council); a number of specimens collected from a city office building, May 1, 1959 (J. S. Cameron). Rotorua, a small sample from an infestation in a new public hospital building, October, 1961 (T. White). Tamarunui, a large series from a public hospital building, April 8, 1951 (R. A. Harrison).

Monomorium pharaonis is an important ant pest which has become almost cosmopolitan through dispersal by commerce. It is apparently of Indian origin, and is common in many areas of Europe, the Americas, Australia, and the Pacific Islands, from which New Zealand receives many cargoes providing suitable transport for such ants. It has been intercepted from a parcel of German rosewood at Palmerston North (December 7, 1956; T. Flint), and from *Croton* leaves carried by air from Fiji to Whenuapai (Manson, 1958).

This ant is probably firmly introduced into New Zealand, and has been responsible for at least two major infestations: those cited above from Tamarunui and Rotorua Public Hospitals. In the former case considerable damage was done to foodstuffs and other materials in storage, and the wards were invaded. *M. pharaonis* was troublesome at Rotorua Hospital during the summer of 1960-61, but its activity was reduced during the succeeding winter. Brown (1958) has reported this ant from the Wellington district, clearly, it is widespread in the North Island, and further serious infestations may be expected.

The publications of Peacock, Hall and their associates (see Bibliography) are important references for information concerning this species. It has been shown by these authors to maintain colonies at temperatures as low as 18°C., and it is able to tolerate short periods at much lower temperatures. In the cooler parts of its range *M. pharaonis* nests indoors, in the woodwork and masonry of buildings, and it can disperse locally by active migration during the summer in warm temperate areas. It also shows considerable capacity for long range passive dispersal and has been taken on transported materials of many types, including edibles, food containers, bed linen, etc. Colonies may be founded by small immigrant

populations of simple composition. Workers are indispensible in such groups, their assistance being obligatory to founding queens. Successful colony establishment, with the production of sexuals, may be accomplished by a minimal group consisting *only* of workers and larvae. The ants are very adaptable and well able to survive the exigencies of initial establishment in a new area. The colonies are populous and may contain many queens. *M. pharaonis* is particularly omnivorous and will infest foodstuffs of all kinds, showing no special preferences for sugary or protein foods, as do some other ant pests.

7. *Mayriella abstinens* Forel.

Material examined. Grey Lynn, Auckland, many foragers and nest series from leaf litter, September 3, 1959-July, 1960 (R. W. Taylor). Mt. Albert Domain, Auckland, a nest from bark on the underside of a rotten log, September, 1959 (R. W. Taylor).

The above records, from localities separated by a distance of about two miles, indicate successful establishment of this interesting species. *M. abstinens* is a minute, cryptobiotic ant, endemic to Australia. Its natural range apparently embraces the eastern highlands, from Cape York to southern Victoria. The species is rare in collections and has generally been taken in Berlese funnel samples of leaf mould or forest floor litter.

Although this ant is abundant at the Grey Lynn site specimens have been located only within a restricted range of about 300 square yards. The site is a non-cultivated area of a domestic garden, beneath a stand of trees where there is a fairly heavy leaf litter cover. The nests observed at Grey Lynn consisted of very small, poorly defined, shallow excavations in the soil among grass roots, or beneath small wood fragments or pebbles. They normally contained about 50-100 workers and several queens. Colonies kept in captivity showed poorly developed cohesion, with groups of workers and queens continually segregating and reassembling randomly. Two separate colony groups, from opposite extremes of the population range, combined without hostility when placed in a common nest chamber. The Mt. Albert series was taken in a small cavity under bark on the lower side of a partly rotted log, lying on the ground. Nests with small crater entrances, in sand, at Cairns, Queensland, have been described by Wheeler (1935b). Freshly killed Collembola, Symphyla, and geophilid centipedes were accepted as food by observation colonies. Males were taken from nests at Grey Lynn during September, 1957.

M. abstinens seems to be a relatively innocuous ant and is unlikely to become a pest in New Zealand.

The Grey Lynn material provides the largest known single population sample of this species. The workers vary greatly in size and some of the larger ones may be ergatogynes. Variation

in colour, sculpture, and morphological characters completely encompasses the extremes which Wheeler (1935b) recognised as characterising several subspecies of *abstinens;* the synonymy of these forms is indicated. The status of *M. spinosior* Wheeler also appears to be jeopardised, particularly when Australian material collected since Wheeler's study is considered.

8. *Tetramorium grassii* Emery.

Material examined (all Auckland district). Auckland, many workers from soil, September 5, 1955 (D. Spiller). Avondale, nest from a flower pot in a glass-house, October 9, 1959 (R. W. Taylor). Grey Lynn, several nests, under stones, February 5, 1960 (R. W. Taylor). Herne Bay, several foragers from a path, July 7, 1953 (R. W. Taylor). Mt. Albert Domain, many nest series, February, 1958-August, 1960 (R. W. Taylor). Mt. Mangere, several nests, July 7, 1953 (R. W. Taylor). Takapuna, males collected at a lighted window, February, 1959 (D. R. Cowley). Te Atatu North, nest under rotten log, December, 1957 (R. W. Taylor).

This interesting species, of African origin, was first recorded from several localities in the Auckland area by Brown (1958). He listed specimens from Remuera and Panmure. Re-examination of the latter material reveals that it was collected during 1941. The presence of *T. grassii* at Paihia, Bay of Islands, in 1948, has since been reported by Cumber (1959). This species has thus been present in Northland for at least thirteen years, and in Auckland for at least twenty.

Tetramorium grassii is now a moderately common ant in parts of the Auckland district, where its local distribution appears, from the available data, to follow an interesting pattern. The species shows a strongly marked preference for dry, sheltered, but well insolated nesting sites, and in every case on which I have collected it the lie of the adjacent land has been towards the north. The Avondale record shows that, like its relatives in north temperate areas, *T. grassii* favours glass-houses as nesting locales. The foragers collected at Richmond were immediately adjacent to the outside wall of a glass-house and may have originated from a nest within it.

The apparent preference of this species for warm northerly situations is well exemplified at Mt. Albert, a small volcanic peak of about 450 feet in the Auckland suburbs. I found *T. grassii* very common there during the years 1958-1959, when nests were located under many of the logs and stones on the northern side of the mountain, but only on those slopes between about 70 degrees east and 60 degrees west of true north. This situation may not be permanent, but could merely represent a stage in the expansion of the population from an original introduction on the northern slopes. However it may well indicate that *T. grassii,* in the

Auckland area, is approaching the southern limit of its possible range, and can maintain populations only in very favourable situations. This same distributional phenomenon seems to be repeated on the nearby Mt. Mangere, and on One Tree Hill, where the ant is common on the north-facing, south side of the crater. In the latter case, however, the situation is complicated due to there being many more rocks suitable for nest cover on the warm side of the crater than on the cold side.

The distribution of *T. grassii* on Mt. Albert is in general complementary to that of the primitive Ponerine *Amblyopone australis* Erichson, which is very common on the southern side of the mountain, but rare on the northern slopes where *grassii* is dominant.

The whole situation of the distribution of *T. grassii*, and its competitive relationships with other ants, deserves further study. This could yield valuable data on micro-climatic preferences or limiting factors in the species, as well as on the general problem of biological competition.

The nests are usually shallow excavations beneath a stone or log, and the ants may utilise bubble cavities or crevices in covering stones for brood storage areas. Food remains in the nests consisted of fragments of small insects and other arthropods. Virgin queens and males were taken from colonies at Mt. Albert during mid and late summer. There seems to be no reason to consider *T. grassii* as economically important.

9. *Tetramorium guineense* (Fabricius).

Material examined. Penrose, Auckland, several nests from under timber lying on a gravel surface in a timber yard, April 23, 1959 (R. W. Taylor).

This is the first properly documented record of *T. guineense* from New Zealand. Brown (1958) was able to indicate its presence, but inadequate labelling on the specimens he examined prevented the citation of definite locality records.

T. guineense is an exceptionally widespread ant, apparently of African origin. It is found throughout the warmer parts of the world, including all states of Australia (Clark, 1941), and most of the Pacific Islands, even such remote groups as the Kermadecs and Easter Island. This species is second only to *Pheidole megacephala* in the number of known records of interceptions at New Zealand ports. I have examined specimens taken from an aircraft at Whenuapai (February 3, 1959; R. J. Prestidge); on a banana plant from Raoul Island, at Auckland; on general cargo from Australia, at Wellington; and at Rotorua on hardwood poles from Borneo, via Auckland (February 2, 1950; R. Zondag). Unlike many ants spread by commerce *T. guineense* does not appear to be a major domestic pest. In Europe and North America it has

been reported as a nuisance in glass-houses and other warm situations, where very large populations may develop. Like other members of its genut *T. guinense* tends sap feeding homopterans. It does not seem likely to become significantly troublesome in New Zealand.

Subfamily Dolichoderinae

10. *Tapinoma melanocephalum* (Fabricius).

Material examined. Auckland, Harbour Board shed 22, Princes Wharf, July, 1959 (P. Wilson).

This single record should perhaps be considered as that of a doubtful introduction, due to the peculiarly marginal collection site. The ants concerned were, however, contributing to a fairly serious infestation of a kitchen cupboard in the shed. They could well have been part of a population sufficiently well established to serve as a nucleus for further dispersal in the Auckland area. The sample includes many workers, several dealate queens and much brood. I have collected workers of this species previously at the Auckland City Markets, on cases of bananas imported from Tonga (July 8, 1957).

T. melanocephalum is a very serious, almost cosmopolitan, house and store pest. It is widespread in tropical America (Smith, 1936), Australia (Clark, 1941) and the Pacific Islands (Wheeler 1935a), and is undoubtedly a regular traveller on New Zealand import cargoes. Like most pest ants, this species is very adaptable and highly prolific. It may nest in buildings, under logs or stones, under bark, or in crevices of plants, etc. (Smith, 1936). It favours honeydew and is an assiduous attendant of aphides, mealy bugs, and scale insects. *T. melanocephalum* must be considered as a very serious potential domestic and horticultural pest in New Zealand.

References

Brown, W. L., Jnr., 1954. Systematic and other notes on some of the smaller species of the ant genus *Rhytidoponera*. *Breviora*, 33: 1-11.

Brown, W. L., Jnr., 1958. A review of the ants of New Zealand (Hymenoptera). *Acta Hym. Fukuoka*, 1: 1-50.

Clark, J., 1941. Notes on the Argentine ant and other exotic ants introduced into Australia. *Mem. Nat. Mus., Victoria, Melbourne*, 12: 59-70.

Cumber, R. A., 1959. Distributional and biological notes on sixteen North Island species of Formicidae (Hymenoptera). *N.Z. Entom.*, 2 (4): 10-14.

Fell, H. B., 1940. Economic importance of *Chalcoponera metallica*. *Nature*, 145: 707.

Jacks, H., 1954. Plant Quarantine: 1. List of plant diseases and pests intercepted in New Zealand in 1951. *N.Z. J. Sci. Tech.*, A 35: 169-71.

Laird, M., 1951. Insets collected from aircraft arriving in New Zealand from abroad. *Vict. Univ. Coll. (N.Z.) Zool. Publ.,* 11: 1-30.

Manson, D. C. M., 1958. *Interceptions of Insects, etc., Entering New Zealand. January,* 1956-*March,* 1957. New Zealand Dept. Agriculture, Plant Quarantine Service.

Manson, D. C. M., 1959. *Interceptions of Insects, etc., Entering New Zealand. March,* 1957-*March,* 1958. New Zealand Dept. Agriculture, Plant Quarantine Service.

Peacock, A. D., Waterhouse, F. L., and Baxter, A. T., 1955. Studies in Pharaoh's ant, *Monomorium pharaonis* (L) 10. Viability in regard to temperature and humidity. *Ent. Mon. Mag.,* 91: 37-42.

Peacock, A. D., Sudd, J. H., and Baxter, A. T., 1955a. Studies in Pharaoh's ant, *Monomorium pharaonis* (L) 11. Colony foundation. *Ent. Mon. Mag.,* 91: 125-129.

Peacock, A. D., Sudd, J. H., and Baxter, A. T., 1955b. Studies in Pharaoh's ant, *Monomorium pharaonis* (L) 12. Dissemination. *Ent. Mon. Mag.,* 91: 130-133.

Smith, M. R., 1936. The ants of Puerto Rico. *Jour. Agric. Univ. Puerto Rico,* 20 (4): 819-875.

Taylor, R. W., 1959. The Australian ant *Iridomymex darwinianus* (Forel) recorded from New Zealand. *N.Z. Ent.* 2 (4): 18-19.

Taylor, R. W., 1960. Taxonomic notes on the ants *Ponera leae* Forel and *Ponera norfolkensis* (Wheeler). *Pacific Science,* 14 (2): 178-180.

Wheeler, W. M., 1935a. Checklist of the ants of Oceania. *Occ. Pap. Bishop Mus.,* 11 (11): 1-56.

Wheeler, W. M., 1935b. The Australian ant genus *Mayriella* Forel. *Psyche,* 42 (3): 151-160.

Wilson, E. O., 1958. Studies on the ant fauna of Melanesia. IV. The tribe Ponerini. *Bull. Mus. Comp. Zool. Harvard,* 119 (4): 320-371.

Occurrence of a Colony of *Amblyopone australis* Erich. (Hymenoptera: Ponerinae) on *Phoenix* sp. at Greenmeadows, Hawke's Bay.

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A large colony of *Amblyopone australis* Erich. was discovered at Greenmeadows on 17/8/60, a cool, dull, windless day, at 10 a.m. The colony ocurred on a palm of *Phoenix* sp., three to four feet in diameter, which was separate from other foliage on an insular lawn.

Several frond stumps were removed from varying positions on the trunk. Infested stumps were loose on the trunk, while those uninfested were quite firmly attached. The main area of infestation was the entire circumference of the mid-trunk, tapering off to nil infestation at the base.

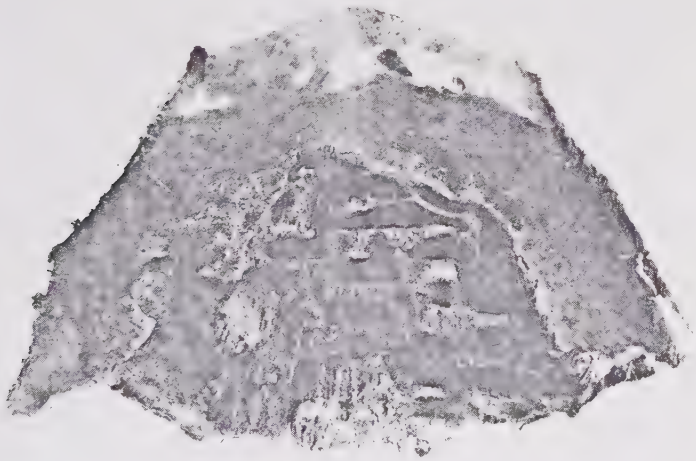

Fig. 1. Galleries of *Amblyopone australis* in the Frond Base After Removal of Loose Matter.

On another palm of the same species, which was separated from the other by a distance of some thirty yards, infestation had apparently only recently commenced, as there were very few adults present, these being in one small area on the mid-trunk. This young colony was facing due West.

Larvae in all stages of development were seen and collected, but there were no pupae present.

Adults moved rather sluggishly that morning, although an observer said they were usually quite fast moving, particularly on warm days.

Two infested stumps were brought back to Palmerston North, with live adults and larvae.

Rhyssa lineolata (Kirby) (Hymenoptera: Ichneumonidae: Pimplinae)

A Species New to New Zealand

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Synopsis

A species of *Rhyssa* previously not known to be established in New Zealand, and identified as *Rhyssa lineolata* (Kirby), was discovered in two exotic forests in the Hawke's Bay area in 1958. This American species is parasitic on *Sirex noctilio* (F.) and is useful for the biological control of this insect. An outline is given of the differences between *R. lineolata, R. persuasoria* (L.), and the native *Certonotus fractinervis* (Vollenhoven).

On November 25, 1958, a female of an unusual *Rhyssa* species was captured by M. A. Stoodley, Forest Biology Observer, in Esk Forest. This insect was found on a *Pinus radiata* D. Don. During the following month a second female specimen was caught by R. L. Cornwell, Forest Ranger, in the office of Gwavas Forest. One specimen was handed over to the Forest Research Institute by Mr. Stoodley, and in February, 1959, this specimen was forwarded to the Commonwealth Institute of Entomology for identification. In reply J. F. Perkins, of the British Museum staff, stated that the specimen agreed best with *Rhyssa lineolata* (Kirby), but that there was inadequate material in the museum collection to be able to differentiate between this North American species and the European *Rhyssa amoena* Grav. A request was made for males since these should show more distinctive differences than the females.

In September, 1959, a small number of *Pinus radiata* logs containing *Rhyssa* larvae, and already showing siricid exit holes, was collected from Esk and Gwavas Forests (Hawke's Bay) and placed in the Forest Research Institute insectary. From these logs enough specimens for identification of the then undetermined *Rhyssa* sp. were obtained by the end of November, and it was expected that more would emerge from this source.

On December 3, 1959, a number of males and females of the *Rhyssa* sp. were sent to the Commonwealth Institute of Entomology. These were examined by Mr. Perkins, but as he was unable to decide whether they belonged to an American or to a Japanese species, they were forwarded to Dr. H. K. Townes in the United States for identification. In the opinion of Dr. Townes "the *Rhyssa* is identical with the western race of *Rhyssa lineolata* Kirby. Western specimens have the white orbital mark interrupted above, while specimens from the east usually have it complete. I would

suppose that the stock came from the Vancouver area."

Whether or not the stock did come from the Vancouver area is uncertain, since a re-examination of the material at the Forest Research Institute has shown several specimens to have an uninterrupted orbital mark. Presumably *R. lineolata* entered the country in imported timber and was in this way accidentally introduced. There are no records of any *Rhyssa* species other than *R. persuasoria* (L.) having been introduced for the biological control of *Sirex noctilio* (F.).

R. lineolata is distributed transcontinentally in Canada and in the Transition Faunal Zones of the United States (Muesebeck, *et al.* 1951, p. 200). Essig (1946, p. 796) gives its distribution as boreal North America, and Colorado, Washington, and British Columbia in the west, Thompson (1957, p. 539) as United States. The following hosts are recorded (Muesebeck *et al.*): *Serropalpus* sp., *Monochamus scutellatus* (Say), *M. titillator* (F.), *Phymatodes dimidiatus* (Kby.), *Sirex edwardsii* Br., *Urocerus albicornis* (F.), *U. cyaneus* (F.), *Xeris* sp. The introduction into New Zealand of one of these hosts of *R. lineolata* cannot at present be ruled out, although none of the above species emerged from the logs from Esk and Gwavas Forests. Experiments at the F.R.I. in which *Rhyssa lineolata* oviposited on *Sirex noctilio* larvae in logs of *Pinus radiata* and *Pinus patula* Schlecht. and Cham. have proved that *R. lineolata* parasitises *Sirex noctilio.*

R. lineolata can be distinguished from *R. persuasoria* by the antennae having a pale band past the middle. Both males and females have this characteristic, but in the male the band is narrower (see Fig. 1 and 2). The European *R. amoena* also has this pale band. An ichneumonid of similar size to *R. lineolata* which occurs in New Zealand is the native *Certonotus fractinervis* (Vollenhoven) formerly known as *Rhyssa fractinervis* Vollenhoven.* In this species the tips of the antennae are yellow, while the body is brown with yellow markings; *R. lineolata* and *R. persuasoria* are black with white markings. A species described by Colenso in 1885 under the name of *Rhyssa clavula* appears to be *C. fractinervis.* Colenso's specimen has not been seen by the authors but the description tallies with the specimens of *C. fractinervis* at the Forest Research Institute.

The number of insects which emerged from the *P. radiata* logs collected in September, 1959, in Esk and Gwavas Forests is given in Table I. Emergences from October 11, 1959, to March 26,

* Mr. A. W. Parrott, Nelson, allows it to be stated that he has in manuscript a redescription of *Rhyssa fractinervis* and is placing this species in its correct systematic position in the genus *Certonotus,* tribe Labenini. The manuscript is to be published at some later date in connection with work on Australian Ichneumonidae. He has also confirmed that *Rhyssa clavula* is a synonym of *Certonotus fractinervis.*

Table I.

Number of *Rhyssa lineolata*, *Rhyssa persuasoria*, *Guiglia schauinslandi* and *Sirex noctilio* which emerged during the period October 11, 1959 to March 26, 1960, from *Pinus radiata* logs collected in Esk and Gwavas Forests.

Week Ending	Logs From Esk								Logs From Gwavas*					
	R. lin.		R. pers.		G. schau.		S. noct.		R. lin.		R. pers.		S. noct.	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
1959														
17 Oct.	—	—	11	—	—	—	—	—	—	—	8	—	—	—
24 Oct.	—	—	13	—	—	—	—	—	—	—	7	—	—	—
31 Oct.	12	—	15	2	—	—	—	—	—	—	1	—	—	—
7 Nov.	18	—	16	2	2	—	—	—	6	—	6	—	—	—
14 Nov.	37	2	8	9	2	—	—	—	58	2	2	1	—	—
21 Nov.	78	2	5	15	6	1	—	—	123	3	—	—	—	—
28 Nov.	31	8	3	7	4	—	—	—	69	2	1	1	—	—
5 Dec.	20	13	3	4	6	1	—	—	64	7	—	2	—	—
12 Dec.	5	18	2	2	2	1	—	—	43	31	1	—	—	—
19 Dec.	3	27	—	6	1	—	—	—	9	79	2	—	—	—
26 Dec.	1	18	—	5	2	1	—	—	5	80	—	—	—	—
1960														
2 Jan.	—	16	—	4	—	3	—	—	1	49	—	—	—	—
9 Jan.	2	11	—	2	—	2	7	—	1	13	—	—	—	—
16 Jan.	—	9	—	1	—	1	51	1	—	12	—	—	2	—
23 Jan.	—	2	1	—	—	—	47	12	—	6	—	—	2	—
30 Jan.	—	2	—	1	—	—	167	19	—	6	—	—	23	3
6 Feb.	—	—	—	1	—	—	22	2	—	2	—	—	6	1
13 Feb.	—	—	—	—	—	—	109	14	—	—	—	—	9	2
20 Feb.	—	—	—	—	—	—	67	15	—	2	—	—	2	4
27 Feb.	—	—	—	—	—	—	17	3	—	—	—	—	3	2
5 Mar.	—	—	—	—	—	—	11	2	—	—	—	—	2	2
12 Mar.	—	—	—	—	—	—	32	17	—	—	—	—	13	2
19 Mar.	—	—	—	—	—	—	2	2	—	—	—	—	1	1
26 Mar.	—	—	—	—	—	—	23	15	—	—	—	—	4	1
Totals	207	122	77	61	25	10	555	102	379	294	28	4	67	13
Grand Totals Esk and Gwavas logs	586	416	105	65	25	10	622	120						

* No *Guiglia schauinslandi* emerged from these logs.

1960, are given by weekly totals. It can be seen from this table that by the middle of December most of the males of *R. lineolata* had emerged, whilst the greatest number of females emerged after this period. A large number of males were kept in cool storage at 4°-6° centigrade. When females emerged several of these males

Fig. 1.—Males of *Rhyssa persuasoria* (at left) and *Rhyssa lineolata*.

Fig. 2.—Females of *Rhyssa persuasoria* (at left) and *Rhyssa lineolata*.

were placed with them in small observation cages or in the insectaries. Mating was observed in both cases but did not occur readily.

The figures in the table give some indication of the usefulness of *R. lineolata* as a parasite of *S. noctilio* in Esk and Gwavas Forests. The total emergence from the logs of 586 males and 416 females of *R. lineolata*, which greatly outnumbered the 105 males and 65 females of *R. persuasoria*, indicates a higher degree of parasitism by *R. lineolata* even though *R. persuasoria* has been established in New Zealand for 30 years. However, the possibility that *R. lineolata* may have hyper-parasitised *R. persuasoria* cannot be ignored. The degree of parasitism of *S. noctilio* was not determined as the number of siricid exit holes was not counted after collection of the logs.

In December, 1959, 26 males and 31 females of *R. lineolata* were released in Waitangi Forest (North Auckland), and breeding is being undertaken at the Forest Research Institute to enable further releases to be made in other forests.

The study of *R. lineolata,* its effectiveness as a parasite of *S. noctilio,* and its relationship with other species which parasitise *S. noctilio* will be continued in subsequent years.

Acknowledgments

Thanks are expressed to Mr. J. F. Perkins, of the British Museum (Nat. Hist.), and Dr. H. K. Townes, of North Carolina State College, for examining and identifying *Rhyssa lineolata* (Kirby); to Mr. M. A. Stoodley for bringing to our notice the first specimen captured in New Zealand; to Mr. A. W. Parrott for the information on *Certonotus fractinervis;* and to Mr. T. Ransfield for the photographs.

References

Colenso, W., 1885. A description of some newly discovered New Zealand insects believed to be new to science. *Trans. Proc. N.Z. Inst.* 17: 151-60 (see p. 158).

Essig, E. O., 1946. *Insects of Western North America.* New York. MacMillan, pp. 1035 (see p. 796).

Morley, C., 1913. *A revision of the Ichneumonidae based on the collection in the British Museum (Nat. History) with descriptions of new genera and species.* Part 2. London, British Museum.

Muesebeck, C. F. W., Krombein, K. V., Townes, H. K. and others. 1951. *Hymenoptera of America North of Mexico.* U.S. Dept. of Agr. Monograph No. 2. Superintendent of Documents, Washington.

Parrott, A. W., 1960. Personal communication.

Thompson, W. R., 1957. *A Catalogue of the parasites and predators of insect pests, Section* 2, *Host Parasite Host, Part* 4, *Hosts of the Hymenoptera, Ichneumonidae.* Ottawa, Commonwealth Bureau of Biological Control (see p. 539).

The Associates of *Pison spinolae* Shuckard (Hymenoptera: Sphecidae)

By D. R. COWLEY,
Department of Zoology, University of Auckland.

During the course of field work, several animals found in association with the nests of *Pison spinolae* are mentioned below.

1. *Melittobia clavicornis,* the most common animal found in mason wasp nests, is a small Hymenopterous insect of the family Eulophidae. Found in cocoons of *P. spinolae* which contain prepupae or pupae, it was first discovered in New Zealand by Cumber (1953).

The parasite appears to have two ways of securing entrance to a cocoon: (a) If it enters a nest in which the larvae have already spun cocoons it bores its way through and enters the cocoon by the hole so formed. Specimens of *P. spinolae* were attacked in this way until the very late pupal stage.

(b) Many cocoons which contained parasites had no small holes in them. I can only assume in such cases that the *Melittobia* adult laid its eggs on the larva before cocoon construction, or that the parasite was enclosed in the cocoon as it was constructed. As eggs were never found on larvae at any time, the second suggestion seems the more feasible.

Three cocoons infested with *M. clavicornis* contained 477, 466 and 634 parasites respectively, almost all of which matured into adults. In all nests which were found to be infested, 46.9% of the host prepupae and pupae, had been destroyed. (241 cocoons examined.)

The only other mention of true parasitism of *Pison* was of *P. decipiens* Smith by a small Chrysid wasp, *Chrysis transversus*—Froggatt (1894).

2. Cocoons collected in the field during winter often contained mites:

Pyemotes ventriculosis (Newport), 1850.
Tyrophagus castellanii Hirst, 1912.
Both had apparently gained entrance through the holes made by *M. clavicornis.*

3. In several old nests larvae of Dermestid beetles were found. These were probably only scavengers on the remains of spiders, as they were not found in cells containing live *P. spinolae* young.

4. During the dry summer period when food is scarce, ants often invade the nest. Three different species were collected.

(a) *Monomorium orientale* Mayr.
(b) *Iridomyrmex glaber* (Mayr).
(c) *Techromyrmex albipes* (Fr. Smith).

These ants attack all stages of *P. spinolae* except adults, eating everything except the cuticle of late pupae.

5. During adverse weather when *P. spinolae* females must cease nest construction before completion of the cells, these cells are sometimes infested with Dipterous eggs. When work is resumed, the cells are sealed off leaving the maggots to devour the contents. Several different species of flies were found to have attacked nests in this manner, but only one group was able to be brought through to the adult state and identified. This particular one was a Phorid known as *Megaselia comparabilis* Schmitz.

Of the animals mentioned only *Melittobia clavicornis* is a true parasite of *Pison spinolae*, all the others being facultative in their association. As there is no record of *M. clavicornis* being found on other Hymenoptera in New Zealand, there is the possibility that it is host specific.

References

Cumber, R. A., 1953. *Melittobia clavicornis* (Cameron). (Eulophidae) Parasite of the Mason Wasp *Pison spinolae* Shuckard (Hym. Trypoxylonidae). *N.Z. Entomologist* 1, 16.

Froggatt, W. W., 1894. *Pison spinolae, decipiens,* habits. *Proc. Linn. Soc. N.S.W.* 9, 33.

Anomalous Development of Ovaries in *Prionoplus reticularis* White (Coleoptera: Cerambycidae)

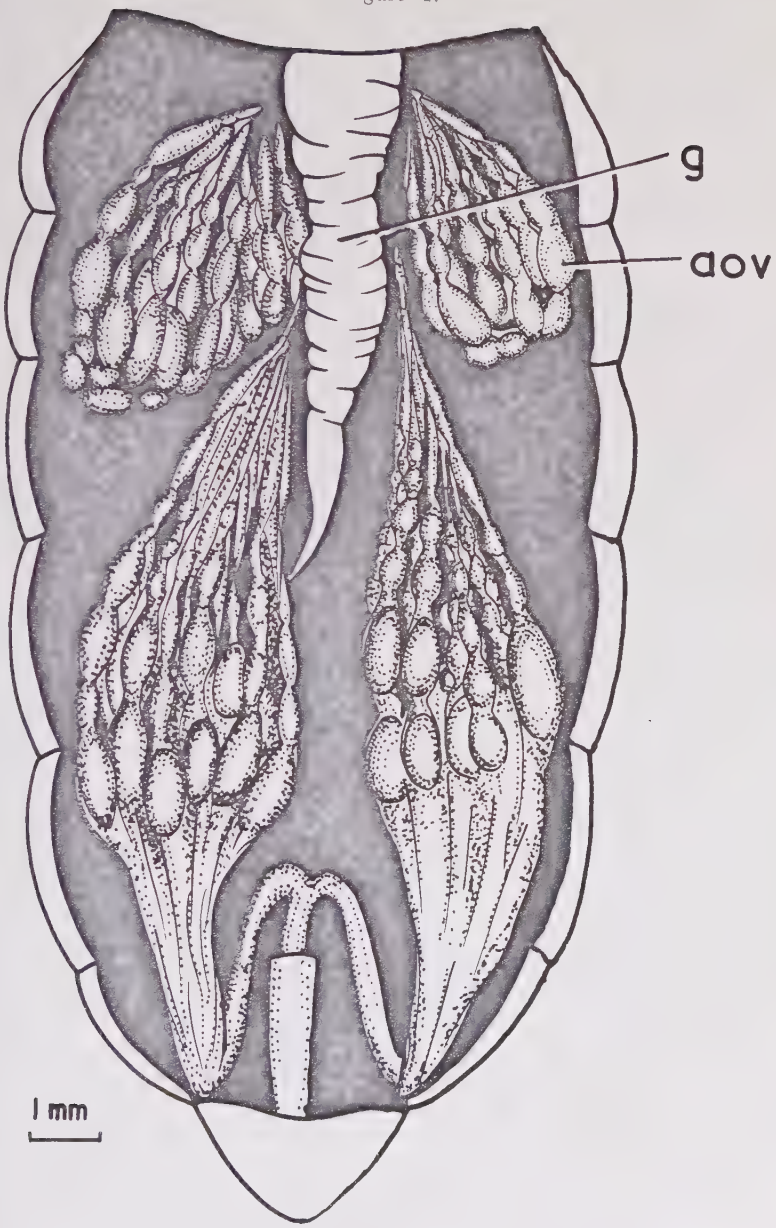
By JOHN S. EDWARDS

In the course of a study of the reproduction of *P. reticularis* during which several hundred pupae were dissected, one large female was found to have developed a supernumary pair of ovaries. The posterior pair of ovaries (Fig. 1) were of normal form (Edwards, 1961), their calyces uniting with lateral oviducts, and the ovarian filaments attaching to the metathoracic phragmata. The anterior supernumary pair were similarly composed of 42 ovarioles on each side and were attached anteriorly beside the ovarian filaments of the "posterior" ovaries, but terminated blindly in the haemocoele without calyces, united only by loose connective tissue. Both pairs were in the same stage of development.

Reference

Edwards, J S., 1961. On the reproduction of *Prionoplus reticularis* White, with general observation on reproduction in the Cerambycidae. *Quart. J. Micr. Sci.* 102: 519-529.

Figure 1.



Dorsal view, dissection of female *Prionoplus reticularis* pupa, showing normal "posterior" ovaries, supernumary "anterior" ovaries (aov), and degenerating midgut (g).

A Generic Correction in the Family Elateridae (Coleoptera).

By E. S. GOURLAY

Entomology Division, Department of Scientific and Industrial Research, Nelson.

The author (1950) erected the genus *Geraniella* to take the place of the preoccupied genus *Geranus* Sharp (1877), but missed reference to the genus *Sphaenelater* Schwarz (1902), which takes precedence to *Geraniella*. Schwarz (1902, p. 365) described *Sphaenelater nigricornis* as a new genus and species from New Zealand, but later (1907) reduced it as a synonym of *Geranus lineicollis* White; his genus *Sphaenelater* is therefore valid.

Sphaenelater Schwarz, 1902.
= *Geranus* Sharp, 1877.
= *Geraniella* Gourlay, 1950.

References

Gourlay, E. S., 1950. Auckland Island Coleoptera. *Trans. roy. Soc. N.Z.*, 78: 192.

Schwarz, O., 1902. Ueber die Elateriden-gattungen *Protelater* Sharp und *Anapasius* Cand. und ihre systematische stellung nebst beschreibung einer neuen gattung und art. *Deutsch. ent. Zeit.*, 46: 364-366.

1907. *Gen. Insect.*, Fasc. 46c: 286-287.

Sharp, D., 1877. On the Elateridae of New Zealand. *Ann. Mag. nat. Hist.*, (4) 19: 397, 398, 480.

Tarsonemid (Scutacarid) Mites and Honey Bees

By T. PALMER-JONES,
Wallaceville Research Station.

Acarapis externus Morgenthaler has been found on honey bees in both North and South Islands and *Acarapis dorsalis* Morgenthaler only in the North Island of New Zealand.

These mites are generally considered harmless.

Acarapis woodi (Rennie), the cause of acarine disease of honey bees, has not been found although some 100,000 bees from all parts of New Zealand have been examined for it during the last sixteen years.

May 16, 1961.

The Editor,

N.Z. Entomologist.

Dear Sir,

I wish to report some points of entomological interest noticed in recent years while working in high mountain grasslands in the South Island.

1. *Pieris brassicae*—Single individuals were noticed at various times in summer 1960-61 on mountains at Arthurs Pass up to 5,000 feet altitude. In former years dead individuals of the species were seen on firm snow at altitudes up to 7,000 and 8,000 feet at Mt. Cook and in the Arrowsmith range.
2. *Vespa germanica*—Wasps have begun to establish in the Waimakariri basin. They have been present in the Craigieburn range and at Arthurs Pass for three summers at least.
3. Mites—A high incidence of mite infestation of various insects was seen at Arthurs Pass, summer 1960-61. The mites are red and about 0.4 mm. long. Insects of the following groups, collected in *Danthonia* grasslands from 4,000 feet to 6,000 feet of altitude carried these mites—Diptera (many species), Lepidoptera (many moths, several butterflies), Cicadas. The mites

crowded on the underside of abdomen and thorax, between the joints of the exoskeleton and some were dislodged with difficulty. Usual numbers per insect observed were three or four, but some insects, particularly Cicadas, carried as many as 25 mites. If an insect appeared to be sluggish, moved aimlessly or flew with difficulty, invariably it was heavily infested.

4. Blossom midge—In five *Danthonia* species investigated (*D. australis, D. crassiuscula, D. flavescens, D. rigida,* D. sp. (mid-ribbed snowgrass)) during the summer 1959-60 at Arthurs Pass, Nelson Lakes, Lewis Pass and Craigieburn Range there were moderate to heavy infestations of flowers by the larvae of an insect. These are about 0.5 mm.-1 mm. long and answer the description of the larvae of the orange wheat blossom midge (H. F. Barnes—The Wheat Blossom Midges—New Biology 14). None of those collected pupated and there is no indication of the nature of the adult. The grubs are capable of limited movement. Details of the degree of infestation will be published later. Similarity to wheat blossom midges and apparent non-specificity to different Danthonias suggest the possibility of a reservoir of infection for wheat crops.

5. Insects in *Celmisia* seed heads. Numerous insects of the groups Lepidoptera, Hemiptera, Diptera, Coleoptera, some adults, some larvae, feed on developing or mature *Celmisia* seed heads. *C. viscosa, C. lyallii, C. spectabilis* at Craigieburn range and *C. coriacea* and *C. armstrongii* at Arthurs Pass are most noticeably affected.

Yours faithfully,

C. J. Burrows.

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